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let the barrel become empty until the fluid is given; sterile absorbent to be placed in the top of barrel. A fountain syringe can be boiled and used, or a funnel. The funnel is our poorest substitute, as it has such a large opening it is hard to keep it covered. When we only have the one needle it is well to put it into a new place when half of the fluid is given.

THE TREATMENT OF PULMONARY TUBERCULOSIS *

By H. H. WEIST, M.D.

(Continued from page 14)

THE idea that overfeeding is necessary in tuberculosis has been a principle long recognized, and it is a matter of common observation that it is not difficult to bring about large gains in weight. But that something more than making the patient fat is necessary has been evident, because the disease itself persists. Extensive and active pulmonary tuberculosis is frequently seen in over-fat individuals. It is manifest from this that something is still lacking to bring about a repair of the lesion. This essential element has been definitely proved to be lime. The lime-salts have a very important part in Nature, and are necessary parts of all vegetable and animal organisms. Lime forms three-quarters of the total mineral solids of the body and is found in all the fluids and tissues as before stated. The human skeleton is largely lime. The formation of cells, the clotting of blood, all nervous and muscular equilibrium depend upon its presence. Phosphate of lime forms a part of the normal structure of every organ in the body. Lime is being constantly discharged from the body as physiological waste material. It is therefore an essential food element. Various results must, therefore, follow an insufficient supply: (1) imperfectly developed organs; (2) lowered resistance to disease; (3) lack of power to repair physiological waste; (4) lack of power to repair injury. Imperfect structure of an organ leads to impaired function. Resistance to disease is a physiological function, therefore imperfect organs must offer imperfect resistance. Growth and repair are dependent upon cell formation. Cell formation will not take place in the absence of lime phosphate. Again, disease having been established, its extension is unobstructed, because no reparative process can occur in the absence of lime phosphate.

In the application of these principles to the treatment of tubercu-

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losis, lime does not destroy the tubercle bacillus, but serves to restore the normal protective function of the cells in producing a healing process (fibrosis) at the point of irritation caused by the growth of the bacillus.

Lime-starvation will result (1) when there is a deficient supply of lime in food, (2) when there is lack of absorption in a form suitable for cell-food. The chief lime-bearing food is milk, which has been prescribed in the treatment of the tuberculous since the earliest times. Next to milk, eggs contain the greatest amount of lime. Milk and eggs are largely employed in the modern dietetic treatment of tuberculosis.

The most important salt of lime is the insoluble phosphate. How is this salt rendered absorbable in a form available by the tissues? It may be stated that its absorption in an assimilable form is best assured when it is administered in combination with proteid substances. In other words, when phosphate of lime is in chemical union with proteid, this combination is acted upon by the gastric juice and prepared for absorption in a condition suitable for nutrition. This proteid combination with lime occurs under normal conditions in the healthy body, and is dependent absolutely upon a sufficient secretion of HCl, without which the action of the enzymes essential to digestion and assimilation cannot occur.

A normal condition then might be represented by sufficient lime-bearing food, plus sufficient proteid, plus a normal secretion of HCl, all present together.

HCl has been demonstrated to be absent or diminished in diseases accompanied by fever, and in many other diseases.

If these truisms are accepted—(1) that lime is essential to the body; (2) that lime-salts are lost in disease; (3) that the most important salt of lime is phosphate; (4) that the absorption of calcium phosphate is best accomplished by combining it with proteid; (5) that HCl is a most essential part of the digestive juice; (6) that hydrochloric acid is absent or diminished in tuberculosis and many other diseases—then it logically follows that the problem of the successful treatment of tuberculosis may be solved by administering a proper amount of lime and sufficient proteid and hydrochloric acid. This is accomplished by adding dilute hydrochloric acid (10 per cent. U.S.P.) to a mixture of milk and eggs. Milk and eggs are not only rich in lime, but they both contain an abundance of proteid, which in eggs exists as albumin and in milk as casein. When dilute hydrochloric acid is added to the mixture, the casein clots. This clotting is produced by the chemical combination of casein with phosphate of lime, forming a

new chemical salt, the caseate of lime, which, after further digestion, is absorbed in a condition suitable for the growth of repair of tissues.

The principles just stated furnish the working basis for what we regard as a specific dietetic treatment for tuberculosis, which is being successfully employed among dispensary and private patients. The theory upon which it is based was evolved by Dr. John F. Russell, with whom I have the honor to be associated, and is the result of years of experiment and observation. In a paper entitled "Treatment of Pulmonary Tuberculosis, Based on the Assumption that the Dietetic Cause of the Disease is Lime-Starvation," published in the *Medical Record* in 1909, Dr. Russell made a contribution to medical science of incalculable value, the crystallized result of fourteen years' labor in dispensary treatment of pulmonary tuberculosis.

Some facts in regard to the practical application of this method in a dispensary may interest you.

The dispensary for the treatment of self-supporting (ambulant) consumptive working people was established fourteen years ago, with the purpose of demonstrating that uncomplicated pulmonary tuberculosis may be treated successfully in the home climate without detention from work. The patients are all working people and must remain at work while undergoing treatment in order to obtain means of livelihood. This is an unchangeable condition. The treatment of their disease is ever secondary to the struggle for subsistence. The hours at the dispensary are arranged so that there shall be no interference with work. Patients report at any time between 7 and 8.30 morning and evening. Patients with pulmonary tuberculosis in any stage of the disease are accepted for treatment whose evening temperature is below 101° and who are clearly not too weak to make the journey from their homes twice daily; who can provide proper food, clothing and shelter, and who live within reasonable distance of the dispensary. When other symptoms are favorable, patients whose evening temperature is 101° or more are accepted provisionally, because it has occasionally been found that, after one or two weeks of treatment, the temperature falls and remains in the neighborhood of 100° . An evening temperature of 100° and 100.5° is not a bar to treatment. No patient with laryngeal tuberculosis in the stage of ulceration is admitted for treatment. No patient is admitted whose sputum does not show the presence of tubercle bacilli. Patients are considered apparently cured when physical signs of disease are no longer present and tubercle bacilli have disappeared from the sputum. Tubercle bacilli are considered to have disappeared when six consecutive examinations, two weeks apart, fail to show their presence.

Upon admission for treatment, patients receive specific direction as to care of sputum, and are given a printed slip of rules for their instruction. They are also taught the importance of sunlight, proper ventilation, proper sleep, the regulation of exercise, and their attention is directed to the small things of daily life which influence nutrition.

Specific directions in regard to food are practically confined to milk, eggs, and acid. Tea, coffee, alcohol, cocoa, chocolate, beef-tea and broths are forbidden.

With the exception of the milk, egg and acid mixture, and emulsion, the amounts of which remain fixed, the daily quantities of other foods are determined by the gain or loss of weight in the patient. It will, therefore, be understood how necessary it is that patients be weighed regularly. Unless patients gain weight, the dietetic treatment is wrong in some particular. There are instances where it is only necessary to gain a few pounds, but increase in weight is important as an indication of improved nutrition.

Patients are weighed, examined, and notes made of their condition every Sunday morning at 10 o'clock. This day is selected because for the greater number it is not a workday, and in consequence they lose no time from labor.

Patients are weighed in a single light gown. Weight-gaining is absolutely insisted upon. Long experience has shown that patients taking the food prescribed cannot fail to gain in weight. Therefore, patients are held strictly accountable in this particular, and failure to gain is regarded as presumptive evidence of disobedience in some particular, unless some condition is found in the lungs to explain it. The patients are taught that their hope of cure depends upon their faithfulness in carrying out the prescribed rules. Discipline is positively maintained. If patients are lax or persistently obstinate, they are dismissed. Beyond a reasonable point, toleration works serious injustice to the faithful and produces discontent and discouragement. This is explained at the first interview with unmistakable clearness. The novelty in this plan of management is its application to dispensary practice; to a class of people who would receive practically no instruction at all.

The coming of patients twice a day gives the opportunity for control which could not be accomplished by less frequent observation. They come ostensibly to take the milk mixture and emulsion, but in reality to be cross-examined by the attendants and faults of living corrected. The change in the morals of patients under this daily supervision is most surprising, and little difficulty is really experienced in having

patients comply with all suggestions. They have, too, the evidence of improvement in their fellows.

The milk, egg, and acid mixture which the patients take at the dispensary is prepared as follows: Two eggs are beaten, strained, and mixed with sufficient milk to make one quart. To each quart of this mixture are added four drachms of dilute HCl and the whole stirred until thoroughly mixed, then replaced in bottles and put on ice. Of this mixture the patients take one-half upon the occasion of their morning visit and the remainder in the evening. In addition to this, they take two ounces of emulsion of mixed fats in hot water, morning and evening. The emulsion is employed solely for the purpose of supplementing the fats. Besides this, the patients take additional eggs and milk at home, if this seems necessary, the maximum amount of milk taken under any circumstances being one and one-half quarts in twenty-four hours, which includes that taken at the dispensary, and six eggs in all.

The quantity of food taken, you will see, is relatively small and inflicts no burden upon patients. In fact, there is no hardship whatever entailed in the method.

The importance of cathartics in the treatment can hardly be overestimated, and they are given regularly and in such amounts as are indicated by the condition of the individual patient. Without cathartics it would be utterly impossible for the patient to take care of so much proteid food. Disappointment will certainly follow the failure of their employment. Their regular and thorough administration does away with the digestive disturbances which are so commonly observed in the tuberculous. No medicines whatever, with the exception of cathartics, are employed at the dispensary.

The results obtained at this dispensary would seem worthy of attention. Fifty-seven per cent. of cures have been obtained, all in advanced cases, and all patients have continued at work during treatment, whereas the average results reported from six well-known sanatoria is 20 per cent. These are The Adirondack Cottage Sanatorium, Rhode Island State Sanatorium, Sharon Sanatorium, Massachusetts State Sanatorium (Rutland), New Mexico Cottage Sanatorium, Loom Sanatorium.

In conclusion: To treat consumptive working people in a dispensary without interruption to their work is certainly an accomplishment of economic importance. It means that they maintain themselves useful, self-respecting, contributing citizens. It means, too, the maintenance of the family, the education of children, the inculcation of ideas of

right living and of the precautions necessary in relations with the healthy—a class of consumptives who can be reached in no other way. It is sufficiently apparent that the wage-earner cannot avail himself of rest and outdoor life without impoverishing himself and family.

A method so comparatively easy of application, so readily available, which contains nothing occult or difficult of comprehension; which entails no great expense; which embraces rational prevention as well as hope of cure, and which involves no interference with personal liberty, merits adoption.

NOTE.—The dispensary treatment referred to by Dr. Weist is described by Mary E. Thornton as follows:

“Dr. Russell’s theories as to the value of lime-salts in the treatment of tuberculous patients are carried out by him and his associates in two clinics in New York, one located on 34th Street, the other on Washington Square, South. At either place the professional visitor is always welcome. One seeking ideas for a clinic for such patients might well adopt the model of that on Washington Square. Walls, woodwork, and chairs are of white enamel, scrubbed down daily. There is an entrance room for new patients while waiting for examination, a consultation room with dressing room attached, cloak rooms for men and for women; and lounging rooms for men and women. All tables are of glass, and on a small one in each room is placed cut tissue paper, which the patient must not be without while in the clinic.

“On entering, he or she takes from the small table in the entrance hall a few sheets of the paper, proceeds to the cloak room, then to the serving room, where he takes a cup, which he holds out for the nurse to fill with milk, taken cold. After taking the milk he holds the cup out again to have it filled with the emulsion, which is taken hot. This may be carried into the lounging room and taken at the patient’s leisure. The cup does not leave the hands of the patient until he has quite finished, when he places it in the sterilizer and live steam is turned on.

“All the rooms are supplied with wide-mouthed basins set low on the floor and flushed by foot lever; thus when obliged to expectorate the patient need not touch anything with his hands.

“The hours for coming to the clinic are 7 to 8.30 A.M., 7 to 8 P.M., Sundays and holidays, rain or shine. No excuse is accepted. The patient who is ill must call in another doctor if he needs one. The head nurse visits every patient’s home and observes just how he lives, under what conditions, what the sleeping arrangements are, etc. Patients are weighed every Sunday and examined on alternate Sundays—women one Sunday, men the next.

“One quart of milk is taken daily at the clinic, and some patients have ‘home milk,’ which they take away with them for use at 10 A.M. and at 3 P.M. Every effort is made to inculcate cheerfulness and hopefulness on the part of the patient, and in this clinic in Washington Square, instituted for self-supporting consumptive people, that is no small part of the battle.”